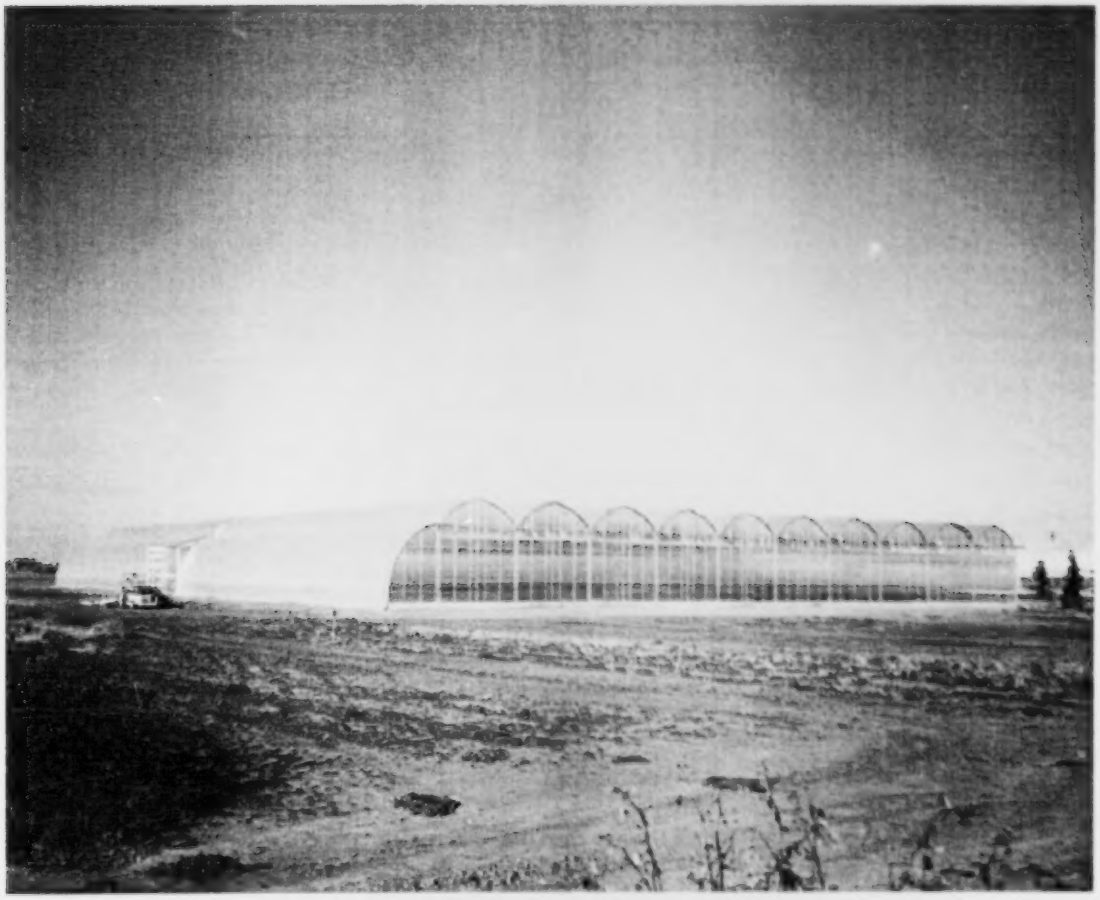
PROFILE OF THE GREENHOUSE INDUSTRY IN ALBERTA



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ALBERTA GREENHOUSE GROWERS ASSOCIATION

April 2001

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PROFILE OF THE GREENHOUSE INDUSTRY IN ALBERTA

(Results of the 2000 Survey)

Prepared for:
Alberta Greenhouse Growers Association (AGGA)

By:
Alberta Agriculture, Food and Rural Development

With Financial Assistance from
Agriculture and Food Council

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Project Team

The project team included:

- G. Nabi Chaudhary, Senior Economics Analyst-Crops, Economics Unit, AAFRD
- Mohyuddin Mirza, Greenhouse Specialist, CDC North, AAFRD
- Asif Maan, Consultant, contracted to conduct the survey and compile data
- Jim Calpas, Greenhouse Specialist, CDC South, AAFRD
- Ken Fry, Alberta Research Council
- Lyle Aleman, Red-Hat Coop, Redcliff
- Magda Beranek (Administrative Assistant) assisted with mailing out initial letters.

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Executive Summary

This survey was initiated at the request of Alberta Greenhouse Growers Association (AGGA) to develop benchmark data for the greenhouse industry in Alberta. Agriculture & Food Council under the Canadian Adaptation and Rural Development Fund program provided funding for this survey.

1. Number Surveyed

In this report, land area, size of greenhouse and crop grown are based on data provided by 386 greenhouse growers while the detailed survey is based on 324 greenhouse growers in Alberta.

2. Area Surveyed

Greenhouse Area: 11,797,951 ft^2 (1 096 464 m^2)

Land Associated with GHs: 22,546.16 Acres (9 128 hectares)

3. Greenhouse Area by Region:

Region	Greenhouse Area (ft^2)	Greenhouse Area (m^2)	Percent of Total
1. Fort McMurray	30,900	2 872	0.003
2. Grande Prairie	940,334	87 392	8
3. Whitecourt	274,972	25 555	2
4. Edmonton	1,722,512	160 085	15
5. Bonnyville	953,058	88 574	8
6. Lloydminster	279,530	25 979	2
7. Red Deer	1,910,868	177 590	16
8. Calgary	1,556,816	144 685	13
9. Medicine Hat	3,778,252	351 139	32
10. Lethbridge	350,709	32 594	3
Total	**11,797,951**	**1 096 464**	**100**

4. Size of Greenhouse Operations:

Size	No. of Greenhouses	Percent of Total
< 10,000 ft²	162	42
10,000 to 19,999 ft²	77	20
20,000 to 40,000 ft²	76	20
>40,000 ft²	71	18
Total	386	100

5. Greenhouse Industry Manpower:

Full-time = 1,360 Part-time = 2,841

6. Primary Heating Systems Most Used:

Gas Furnace – 88% Hot Water – 31% Steam – 15%

7. Number of Greenhouses Constructed Since 1998:

Year	No. of Greenhouses	Area (Sq.ft)
1999	12	139,062
2000	4	23,040
Total	16	162,102

8. Type of Computers:

Personal Computer – 58% Priva – 13% Argus – 6%

9. Biological Controls Most Used:

Encarsia Formosa – 19% Hypoaspis miles – 12% Amblyseiulus cucumeris – 11%

10. Major Insect Pests:

Aphids – 57% Whitefly – 47% Thrips – 41%

11. Greenhouse Operation:

Seasonal – 52% Year round – 48%

12. Irrigation Systems:

Hand Watering – 72% Drip Irrigation – 50% Overhead Sprinkler – 22%

13. Major Disease Problems:

Pythium/Damping off – 61% Botrytis – 47% Powdery Mildew – 46%

14. Fertilizer Injector Systems:

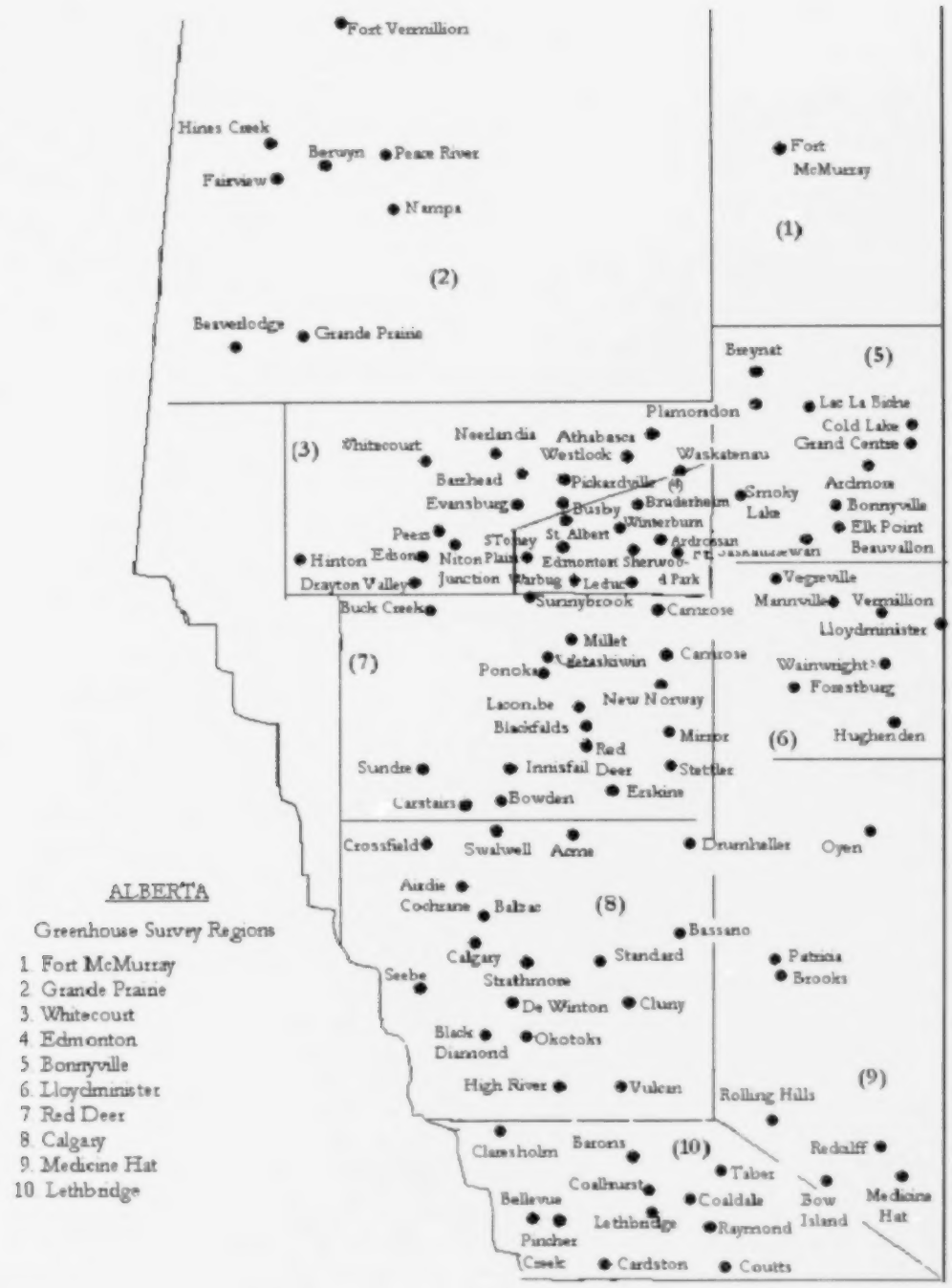
Dosatron – 33% Anderson – 19% Smith – 10%

15. Distribution of Greenhouse Area by Crops:

Greenhouse Crops	No. of Growers	Area (Sq. ft.)	Area (m^2)
Vegetables			
Cucumbers	76	2,369,585	220 221
Tomatoes	68	958,399	89 071
Egg Plant	2	2,000	186
Peppers	28	462,457	42 979
Lettuce	9	108,750	10 107
Other Crops	6	85,032	7 903
Sub-Total	**189***	**3,936,223**	**365 820**
Floriculture			
Bedding Plants	265	3,018,041	280 487
Potted Flowers & Ornamentals	53	628,480	58 409
Cut Flowers	26	467,350	43 434
Herbs	40	184,173	17 116
Perennials	170	1,230,914	114 397
Sub-Total	**554***	**5,505,358**	**511 650**
Tree Seedlings	**27**	**2,282,770**	**212 153**
TOTAL	**770***	**11,797,951**	**1 096 464**

*Growers producing multiple crops. Actual number of growers surveyed for crops grown was 386.

Figure 1. Map of Alberta Illustrating Regions and Major Centers.



Section 1

Introduction

Greenhouse industry survey was initiated at the request of Alberta Greenhouse Growers Association (AGGA) to develop benchmark data for the greenhouse industry in Alberta. Other organizations who participated in undertaking this project were Alberta Agriculture, Food and Rural Development (Economics and Competitiveness, and Plant Industry Divisions) and Agriculture and Food Council (AFC). In addition to funding from AGGA, Agriculture and Food Council provided major financial assistance for this initiative under the Canadian Adaptation Rural Development (CARD) program.

Major greenhouse crops grown include vegetables, bedding plants, potted flowers and ornamentals, cut flowers, herbs, perennials and tree seedlings. More recently, particularly over the last decade a number of the greenhouse operations have switched to producing tree seedlings under contract for the forestry industry. During the last decade, greenhouse industry in Alberta has grown rapidly. This growth was prompted by consumer demand for fresh and quality produce. Alberta advantage in terms of lower taxed and input costs also contributed to this growth. However, recent rapid escalation of natural gas and electricity prices have dampened further expansion prospects for this industry.

The size of Alberta's greenhouse industry, under both glass and plastic, was about six million square feet (138 acres) in 1990. In 2000, the area under cover in Alberta has increased to over 11.8 million square feet (270 acres), an increase of almost 90 percent during the last decade. Alberta greenhouse industry is ranked fourth in the country when compared to the other provinces. Ontario continues to lead the greenhouse industry with 66 million square feet (1,515 acres) area, followed by British Columbia at 33 million square feet (758 acres) and Quebec at 26 million square feet (597 acres).

Approximately 99 percent of the greenhouse area in Alberta is under commercial production, with the balance confined to institutions such as universities, research stations and colleges. Most of the Alberta's greenhouse operations are highly diversified and are equipped with most modern equipment to achieve production efficiencies. As mentioned above, crops most commonly grown in these controlled facilities include long english cucumbers, tomatoes, peppers, lettuce, bedding plants, cut flowers, mums, foliage plants, poinsettias, roses and geraniums, etc. The gross revenue generated by the greenhouse industry in 2000 was estimated at about $98 million, with an investment or total value of assets of about $225 million.

Objectives of the Study

The purpose of this project was to:

1. Prepare an overall profile of the industry,
2. Assess the economic impact of the greenhouse industry on the Alberta economy
3. Identify the challenges faced by the industry in the coming years.

Methodology and Survey Responses

The information provided in this report is based on data collected through personal interviews with greenhouse growers in Alberta. The questionnaire was developed in consultation with Nabi Chaudhary, Dr. M. Mirza and other staff members in the AAFRD Economics Unit. Three hundred and eighty six, greenhouse growers in Alberta were initially contacted for this survey. Out of three hundred and eighty six, three hundred and twenty four or 84% of greenhouse operators fully participated in completing the survey. Sixty-two or 16% of the greenhouse operators gave information only on the size of the greenhouse and crops grown. Therefore, the greenhouse area and crops grown are based on information from 386 greenhouse growers.

The Alberta Greenhouse Growers Association membership form and Greenhouse Coverings Newsletter were also distributed to growers participating in the survey.

Section II

Greenhouse Industry Survey By Regions

For internal comparison purposes, the province has been divided into ten regions, which make up the survey area. The city chosen to name the region was used for one or both of the following two reasons:

1. It is the dominant center.
2. It has a centralized position relative to the region.

The borderlines were drawn according to regional centers, individual greenhouse placements and also to encompass populated areas in a simple manner. See Figure 1. and Appendix 3.

Land Associated and Greenhouse Area in Region

Table 2.1 presents land associated with greenhouse and greenhouse areas for each region. The data provided in this table is based on 386 greenhouse operations in Alberta. The area outside the regional center in each region is also listed.

Table 2.1 Land Associated and Greenhouse Area in Region

Region	Regional				
	Land Area		Greenhouse Area		
	(Acres)	(Hectares)	(ft^2)	(m^2)	Percent of Total
1. Fort McMurray	1,300.76	527	30,900	2,872	0.003
2. Grande Prairie	1,684.41	682	940,334	87,392	8
3. Whitecourt	2,010.06	814	274,972	25,555	2
4. Edmonton	2,335.00	945	1,722,512	160,085	15
5. Bonnyville	1,329.52	538	953,058	85,228	8
6. Lloydminster	3,955.25	1,601	279,530	25,979	2
7. Red Deer	3,980.31	1,611	1,910,868	177,590	16
8. Calgary	3,503.57	1,418	1,556,816	144,686	13
9. Medicine Hat	1,302.07	527	3,778,252	351,139	32
10. Lethbridge	1,145.21	464	350,709	32,594	3
TOTAL	**22,546.16**	**9,128**	**11,797,951**	**1,096,464**	**100**

Note: Conversion rate: One Hectare = 2.47 Acres Square metre = 10.76 Sq. ft.

Table 2.2 Land and Greenhouse Area in Regional Centers

Region	Regional Centers				
	Land Area		Greenhouse Area		
	(Acres)	(Hectares)	(ft^2)	(m^2)	Percent of Total
1. Fort McMurray	20.30	8	10,900	1,013	0.35
2. Grande Prairie	302.84	123	95,580	8,883	3
3. Whitecourt	28.00	11	31,800	2,955	1
4. Edmonton	950.35	385	564,800	52,491	18
5. Bonnyville	171.00	69	469,744	43,657	14
6. Lloydminster	0.92	0.37	20,000	1,859	1
7. Red Deer	105.22	43	438,318	40,736	14
8. Calgary	138.22	56	484,190	44,999	16
9. Medicine Hat	110.06	45	872,798	81,115	28
10. Lethbridge	345.37	140	152,728	14,194	5
TOTAL	**2,172.28**	**879**	**3,140,858**	**291,901**	**100**

Note: Conversion rate: One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Table 2.3 Land and Greenhouse Area in Area Less Regional Center

Region	Area Less Regional Center				
	Land Area		Greenhouse Area		
	(Acres)	(Hectares)	(ft^2)	(m^2)	Percent of Total
1. Fort McMurray	1,280.46	518	20,000	1,859	0.23
2. Grande Prairie	1,381.57	559	844,754	78,509	10
3. Whitecourt	1,982.06	802	243,172	22,600	3
4. Edmonton	1,384.65	561	1,157,712	107,594	13
5. Bonnyville	1,158.52	469	483,314	44,918	6
6. Lloydminster	3,954.33	1601	259,530	24,120	3
7. Red Deer	3,875.09	1569	1,472,550	136,854	17
8. Calgary	3,365.35	1362	1,072,626	99,686	12
9. Medicine Hat	1,192.01	483	2,905,454	270,024	34
10. Lethbridge	799.84	324	197,981	18,400	2
TOTAL	**20,373.88**	**8249**	**8,657,093**	**804,563**	**100**

Note: Conversion rate: One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Number of Greenhouses in Regional Centers and Out of Regional Centers

This table lists the number of greenhouse operations surveyed in each region. Three hundred eighty six greenhouses were surveyed. Out of 386, eighty-five were from the regional centers, followed by 301 from out of regional centers.

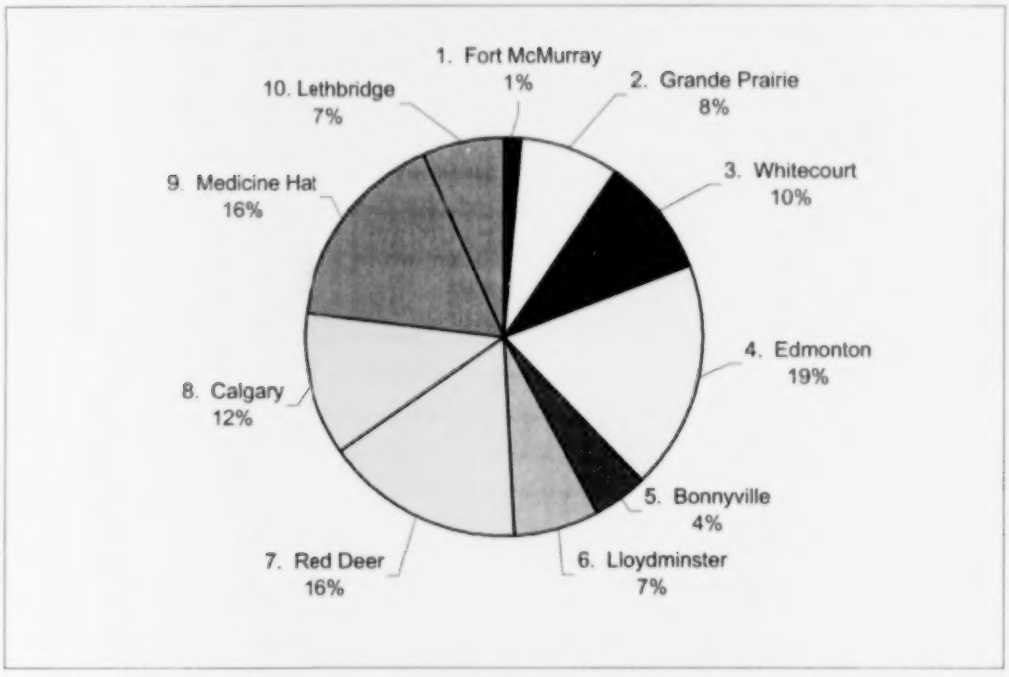
Table 2.4 Number of Greenhouses in Regional Centers and Out of Regional Centers

Region	Greenhouses Surveyed	Number of Greenhouses in Regional Centers	Number of Greenhouses less Regional Centers
1. Fort McMurray	5	3	2
2. Grande Prairie	31	5	26
3. Whitecourt	38	2	36
4. Edmonton	72	26	46
5. Bonnyville	17	4	13
6. Lloydminster	27	1	26
7. Red Deer	62	9	53
8. Calgary	45	12	33
9. Medicine Hat	63	14	49
10. Lethbridge	26	9	17
TOTAL	**386**	**85**	**301**

Number of Greenhouses by Region

Figure 2 presents the percentage of greenhouses constructed in each region. Nineteen percent of greenhouses were constructed in Edmonton, followed by Bonnyville with four percent, Lloydminster with seven percent, Red Deer with 16 percent, Calgary with 12 percent, Medicine Hat with 16 percent, Lethbridge with seven percent, Fort McMurray with one percent, Grande Prairie with eight percent and Whitecourt with ten percent.

Figure 2. Number of Greenhouses by Region



Institutional Facilities

A number of greenhouse operations were reported as institutional facilities. The provincial area types, number of institutional facilities, land area associated with greenhouses and greenhouse areas are listed in Table 2.5. Total number of institutional facilities surveyed were 23 in the province. Land and greenhouse areas were 567 ha and 14,339 sq. m.

Table 2.5 Institutional Facilities

Type	Number of Facilities	Land Area		Greenhouse Area	
		(Acres)	(Hectares)	(ft^2)	(m^2)
1. City and Provincial Park	2	0.28	0.11	28,500	2,649
2. Schools and Colleges	6	1,202.14	487	36,700	3,411
3. Universities (Research & Grounds)	4	0.59	0.24	18,600	1,729
4. Provincial and Federal Research	5	0.73	0.3	37,632	3,497
5. Correctional Institutions	4	150.28	61	18,356	1,706
6. Private Research	2	47.00	19	14,500	1,348
TOTAL	**23**	**1401.02**	**567**	**154,288**	**14,339**

Note: Conversion rate: One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Table 2.6 Number and Area of Commercial vs. Institutional Greenhouse Operations

Region	Commercial			Institutional		
	Number of Greenhouses	Land Area (Hectares)	Greenhouse Area (m^2)	Number of Facilities	Land Area (Hectares)	Greenhouse Area (m^2)
1. Fort McMurray	5	527	2,872	0	0.00	0
2. Grande Prairie	28	682	86,183	3	0.11	1,208
3. Whitecourt	38	814	25,555	0	0.00	0
4. Edmonton	65	928	157,194	7	17.48	2,890
5. Bonnyville	17	538	85,228	0	0.00	0
6. Lloydminster	24	1,601	24,334	3	0.00	1,645
7. Red Deer	60	1,125	175,592	2	485.83	1,998
8. Calgary	42	1,419	141,340	3	0.00	3,346
9. Medicine Hat	62	527	350,581	1	0.11	558
10. Lethbridge	22	400	29,900	4	63.68	2,694
TOTAL	**363**	**8,561**	**1,078,779**	**23**	**567.21**	**14,339**

Note: Conversion rate: One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Size of Greenhouse Operations in Alberta, 2000

The various sizes of Alberta greenhouses have been grouped in to four categories and are listed by region in Table 2.7.

Table 2.7 Size of Greenhouse Operations in Alberta, 2000

Region	Greenhouse Area (sq.ft)				Total Number of Greenhouses by Region
	< 10,000	10,000 to 19,999	20,000 to 40,000	>40,000	
1. Fort McMurray	3	2	0	0	5
2. Grande Prairie	23	3	1	4	31
3. Whitecourt	26	8	4	0	38
4. Edmonton	25	19	20	8	72
5. Bonnyville	7	5	2	3	17
6. Lloydminster	18	5	3	1	27
7. Red Deer	27	16	9	10	62
8. Calgary	15	12	12	6	45
9. Medicine Hat	4	2	19	38	63
10. Lethbridge	14	5	6	1	26
TOTAL	**162**	**77**	**76**	**71**	**386**
Percent of Total Number of Operations	**42**	**20**	**20**	**18**	**100**

Section III

Experience and Education of Greenhouse Operators

Three hundred and twenty four greenhouse operators were personally visited and their experience in the greenhouse industry has been grouped into five categories listed by region in Table 3.1.

Table 3.1 Years of Experience of Greenhouse Operators in Alberta

Region	Operators Experience (Years)					Total Number of Operators by Region
	< 10	10 to 19	20 to 29	30 to 40	> 40	
1. Fort McMurray	0	1	1	0	0	2
2. Grande Prairie	14	4	6	2	0	26
3. Whitecourt	15	10	4	3	0	32
4. Edmonton	13	16	17	10	0	56
5. Bonnyville	6	5	4	0	0	15
6. Lloydminster	5	12	3	2	0	22
7. Red Deer	20	20	10	1	2	53
8. Calgary	11	15	12	5	0	43
9. Medicine Hat	13	28	3	8	1	53
10. Lethbridge	8	5	6	2	1	22
TOTAL	**105**	**116**	**66**	33	**4**	**324**

Greenhouse Operators Education

Table 3.2 lists the education level of greenhouse growers. A total of 324 growers responded to the education question. Of this total, 122 (38%) of greenhouse growers had Grade 12 or less; 138 (43%) were either Olds College graduates or had taken courses in horticulture; 46 (14%) of growers had completed their Bachelor of Science degrees and nine (3%) had post-graduate education, M. Sc. degrees.

Table 3.2 Education Level of Greenhouse Operators in Alberta, 2000

	Education				
	Grade 12 or Less	Olds College Grad./ Courses	B.Sc.	M.Sc.	Other*
No. of responses	122	138	46	9	9
Percent of responses	38	43	14	3	3

* Business minded but no specific education level stated.

Section IV

Construction of Greenhouse Facilities in Alberta

Table 4.1 presents the number of greenhouses constructed by decade. The major construction of greenhouses took place in 1990's with 153, 1980's with 95 and 1970's with 46 greenhouses.

Table 4.1 Construction of Greenhouses in Alberta By Decade

First Built	No.	First Built	No.	First Built	No.
1910's	1	1950's	3	1990's	153
1920's	0	1960's	17	2000's	4
1930's	2	1970's	46		
1940's	0	1980's	95		

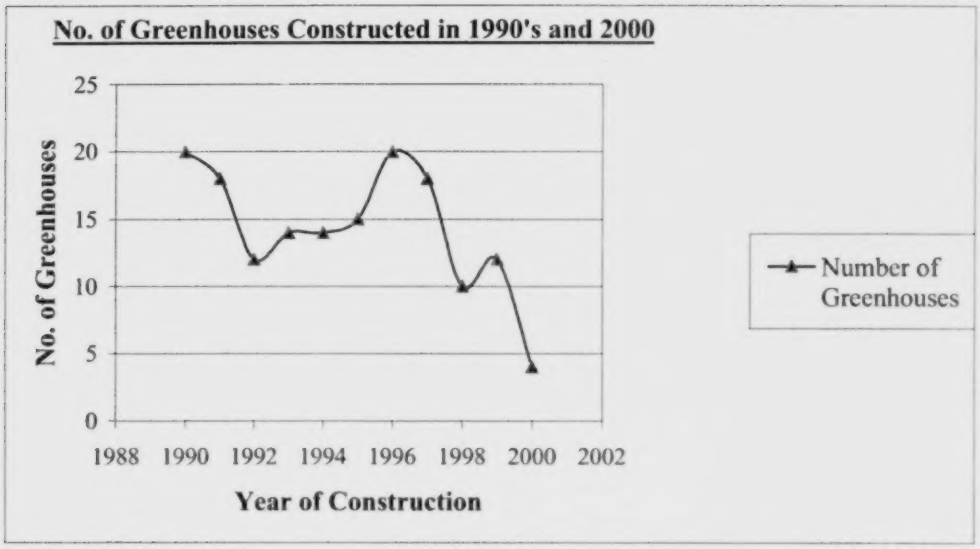
Year of Construction of Greenhouse Structures in Alberta, 1990-2000

Table 4.2 indicates that maximum greenhouses were constructed in year 1990 and 1996. The least construction was in year 2000.

Table 4.2 Year of Construction of Greenhouse Structures in Alberta

Year of Construction	Number of Greenhouses
1990	20
1991	18
1992	12
1993	14
1994	14
1995	15
1996	20
1997	18
1998	10
1999	12
2000	4

Figure 3. Number of Greenhouses Constructed in 1990's and 2000



The above figure is based on data presented in Table 4.2 on the previous page. A drop in new greenhouse construction in 2000 can be attributed to a sudden jump in natural gas cost. Greenhouse growers who were thinking of expanding their operations and new entrants to the industry have put their plans on hold. Any future expansion depends on what happens to the cost of natural gas.

Section V

Greenhouse Crop Production by Region

Table 5.1 lists the number of growers of each crop in ten regions. The number of cucumber growers was 76, followed by Tomato with 68, Pepper with 28, Lettuce with 9, Bedding plants with 265, Potted Flowers & Ornamentals with 53, Cut Flowers with 26, Herbs with 40, Perennials with 170 and Tree Seedlings with 27 crops. It must be noted that there were several growers who produced multiple crops, on an average of two crops per operation.

Table 5.1 Greenhouse Crop Type by Region in Alberta

Crops	Region										Total No. of Growers by Crop
	1	2	3	4	5	6	7	8	9	10	
Cucumbers	1	4	9	5	0	2	8	8	38	1	76
Tomatoes	1	6	11	8	2	2	12	11	14	1	68
Egg Plant	0	0	0	0	0	0	1	1	0	0	2
Peppers	1	2	3	2	0	1	3	4	9	3	28
Lettuce	0	0	1	0	0	1	3	2	2	0	9
Other Crops	1	0	0	1	1	0	0	1	1	1	6
Bedding Plants	4	25	32	64	11	20	51	27	8	23	265
Potted Flowers & Ornamentals	0	2	3	16	2	6	9	8	3	4	53
Cut Flowers	0	4	3	5	1	7	2	0	2	2	26
Herbs	1	6	5	10	1	2	4	3	1	7	40
Perennials	1	19	21	42	7	11	32	21	1	15	170
Tree Seedlings	1	3	1	3	4	0	6	3	5	1	27
Total No. of Growers by Region	**11**	**71**	**89**	**156**	**29**	**52**	**131**	**89**	**84**	**58**	**770**

"Other Crops" includes Cauliflowers, Celery, Mustard, Beans, Canola, Cabbage Seedling and Spinach.

Vegetable Area By Region

Table 5.2 presents the total area devoted to each crop by region.

Table 5.2 Vegetable Production Area in Alberta, 2000

Region	Greenhouse Area Committed to Vegetable Crop (Sq.m)					Total Area by Region (Sq.m)
	Cucumbers	Tomatoes	Peppers	Lettuce	Other Crops	
1. Fort McMurray	105	105	105	0	0	314
2. Grande Prairie	665	1,372	303	0	0	2,340
3. Whitecourt	2,182	2,991	486	23	0	5,682
4. Edmonton	7,221	4,786	121	0	390	12,518
5. Bonnyville	0	1,471	0	0	77	1,549
6. Lloydminster	743	836	465	139	0	2,184
7. Red Deer	26,812	8,281	10,836	1,673	93	47,695
8. Calgary	4,137	8,197	777	3,625	1,394	18,130
9. Medicine Hat	175,536	60,071	23,123	4,647	2,602	265,978
10. Lethbridge	32	32	6,764	0	2,602	9,430
Total Area by Vegetable	**217,434**	**88,141**	**42,979**	**10,107**	**7,159**	**365,820**

"Other Crops" include Egg Plant, Cauliflowers, Celery, Mustard, Beans, Canola, Cabbage Seedling and Spinach. Note: Conversion rate: One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Floriculture Area by Region

Table 5.3 indicates the area under floriculture according to each region.

Table 5.3 Floriculture Production Area in Alberta, 2000

Region	Greenhouse Area Committed to Floriculture Production (Sq.m)					Total Area by Region (Sq.m)
	Bedding Plants	Potted Flowers & Ornamentals	Cut Flowers	Herbs	Perennials	
1. Fort McMurray	1,536	0	0	232	232	2,000
2. Grande Prairie	13,926	1,673	362	1,059	7,918	24,938
3. Whitecourt	12,403	1,487	651	586	4,374	19,502
4. Edmonton	86,553	18,170	3,095	5,372	31,366	144,555
5. Bonnyville	5,862	562	232	465	1,744	8,866
6. Lloydminster	7,844	2,448	10,228	418	2,020	22,958
7. Red Deer	55,484	12,961	13,987	1,162	20,929	104,523
8. Calgary	69,606	9,654	0	1,125	39,665	120,049
9. Medicine Hat	10,541	8,829	13,941	4,647	2,602	40,560
10. Lethbridge	13,944	1,696	604	2,050	4,196	22,491
Total Area by Plants	**277,699**	**57,480**	**43,099**	**17,116**	**115,048**	**510,442**

Note: Conversion rate: One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Tree Seedlings Area by Region

Table 5.4 indicates the area under Tree seedlings by region.

Table 5.4 Tree Seedling Production Area in Alberta, 2000

Region	Tree Seedling Production Area(Sq.m)
1. Fort McMurray	558
2. Grande Prairie	59,835
3. Whitecourt	372
4. Edmonton	2,770
5. Bonnyville	74,814
6. Lloydminster	0
7. Red Deer	25,372
8. Calgary	3,717
9. Medicine Hat	44,600
10. Lethbridge	116
Total Area by Plants	212,153

Note: Conversion rate:

One Hectare = 2.47 Acres One Sq. m = 10.76 Sq. ft

Section VI

Orientation of Greenhouse Structures by Region

Seventy percent of greenhouses are directed to north-south and 54 percent to east-west, 48 percent are operated year round while 52 percent are seasonal.

Table 6.1 Orientation and Operation of Greenhouses by Region

Region	Orientation		Total by Region	Operation		Total by Region
	NS*	EW**		Year round	Seasonal	
1. Fort McMurray	2	1	3	0	2	2
2. Grande Prairie	20	10	30	8	18	26
3. Whitecourt	20	21	41	8	24	32
4. Edmonton	35	40	75	19	36	55
5. Bonnyville	9	9	18	4	12	16
6. Lloydminster	16	9	25	8	14	22
7. Red Deer	42	23	65	23	30	53
8. Calgary	35	21	56	25	18	43
9. Medicine Hat	35	29	64	50	3	53
10. Lethbridge	13	11	24	10	12	22
Total	227	174	401	155	169	324
Percent of Total	70	54	-	48	52	100

* North-South direction

** East-West direction

Financing Aspects (Loans)

Some of the growers obtained loans from more than one institution. Three hundred and eleven growers responded to this question on the survey. Eighteen percent growers received a loan from AFSC, 41 percent from the Bank, 37 percent were self-financed and 8 percent from the Farm Credit Corporation (FCC).

Table 6.2 Type of Financing Aspects (Loans)

Region	Financial Institutions				Total by Region
	AFSC*	Bank	Self-financed	FCC**	
1. Fort McMurray	0	0	2	0	2
2. Grande Prairie	0	9	15	0	24
3. Whitecourt	2	10	17	4	33
4. Edmonton	7	19	26	4	56
5. Bonnyville	1	7	7	0	15
6. Lloydminster	0	10	9	1	20
7. Red Deer	9	28	13	1	51
8. Calgary	5	17	20	2	44
9. Medicine Hat	30	24	3	13	70
10. Lethbridge	3	9	8	1	21
Total No. of Growers	57	133	120	26	336
Percent of Growers	18	41	37	8	-

* Alberta Financial Services Corporation ** Farm Credit Corporation

Glazing Material

Table 6.3 indicates multiple structures per grower. Three hundred and twenty four growers responded question. Eighty nine percent of growers used double polyethylene, 10 percent used fibreglass and 16 percent used glass.

Table 6.3 Type of Glazing Material Used in Greenhouses

	Type of Glazing Material					
	Polyethylene (Double)	Polyethylene (Single)	Side Walls Polycarbonate	End Walls Polycarbonate	Fiberglass	Glass
No. of responses	288	20	134	158	32	51
Percent of responses	89	6	41	49	10	16

N=324

Framing Material

Table 6.4 indicates the type of framing material that was used in greenhouses. Eighty-one percent of growers used steel, 25 percent used aluminium and 23 percent used wood. It indicates multiple use of framing material per grower.

Table 6.4 Type of Framing Material Used in Greenhouses

	Type of Framing Material		
	Wood	**Steel**	**Aluminum**
No. of responses	75	261	81
Percent of responses	23	81	25

N= 324

Section VII

Heating Systems Used in Greenhouse Operations

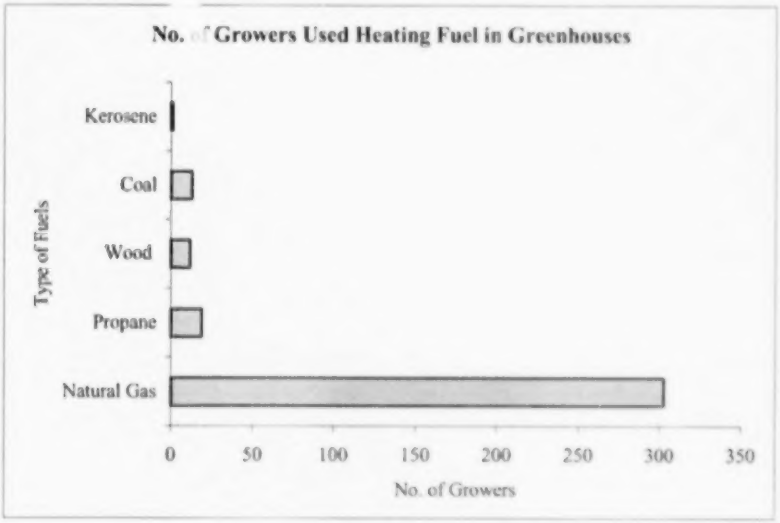
Table 7.1 lists the type of heating fuel used by growers in greenhouses. Ninety-three percent of growers used natural gas, six percent used propane, four percent used wood and one percent used coal and kerosene oil.

Table 7.1 Type of Heating Fuel Used in Greenhouses

	Type of Heating Fuel				
	Natural Gas	**Propane**	**Wood**	**Coal**	**Kerosene**
No. of responses	303	19	12	13	1
Percent of responses	93	6	4	4	0

Note: Multiple types of heating fuels per grower are included in this table. N=324

Figure 4. Number of Growers Using Heating Fuel in Greenhouses



Three hundred and twenty four growers responded to this question. Some of them used multiple types of heating fuels. Out of 324, three hundred and three growers used natural gas while 19 used propane, 12 used wood, 13 used coal and 1 used kerosene. This trend shows that greenhouse industry heavily depends upon natural gas. Hike in gas prices will have adverse effect on the growth of this industry.

During the survey growers showed interest to move to a coal system but the cost of installation of a coal system was their major concern.

Heating System

Table 7.2 lists the type of heating system used by growers in the greenhouse industry in Alberta. Eighty-eight percent of growers used natural gas furnace, 31 percent used hot water, 15 percent used steam, 10 percent used in-floor heating, 5 percent used propane furnace, 2 percent used soil heating, electric, stove pipe heater and 1% coal deckker and bio-therm (hot water).

Table 7.2Type of Heating System Used in Greenhouses

Responses	Systems	Percent of Responses
285	Natural Gas Furnace	88
102	Hot Water	31
48	Steam	15
31	In-floor heating	10
16	Propane Furnace	5
8	Soil Heating	2
7	Electric	2
5	Stove Pipe Heater	2
4	Coal Deckker	1
2	Bio-therm	1

N=324

Use and Capacity of Boilers

Thirty seven percent of the growers used boilers in greenhouses. Out of 324, three hundred and three growers responded to the question of capacity of boilers. Two hundred fifty seven boilers were used in the greenhouse industry in Alberta.

Table 7.3 Use and Capacity of Boilers

	Use of Boilers		Capacity of Boilers		
	No	Yes	Number of Boilers	Output (mill/btu)	HP
No. of responses	205	119	257	132,232,570	11,945
Percent of responses	63	37	-	-	-

N=324

Heating Costs

Seventy seven percent of the growers responded to this topic of the survey. Twenty-two percent of the growers did not wish to disclose heating cost expenditure. "Price of Other Fuel" includes, propane, wood and coal.

Table 7.4 Natural Gas Expenditure in Greenhouses

	Natural Gas Expenditure			Price of Other Fuel ($)
	Responses	1999 ($)	2000 (Up to June) ($)	
No. of responses	252	6,333,234	5,429,596	50,851
Percent of responses	77	-	-	-

N=324

Impact of High Natural Gas Price

In Table 7.5, eighty-five percent of the growers indicated the high impact of natural gas price on their business. Fifteen percent of the growers used other fuel and would not be affected significantly by higher gas price.

Table 7.5 Impact of High Natural Gas Price

	Impact of High Natural Gas Price		Average Price of Natural Gas/GJ ($) 1999
	Yes	No	
No. of responses	277	47	5.78
Percent of responses	85	15	-

Use and Recovery of CO_2 in Greenhouses

Table 7.6 lists the use and recovery of CO_2 in greenhouses. Only 27 percent of the growers used CO_2 in greenhouses. Nine percent of the growers had CO_2 recovery system in greenhouses.

Table 7.6 Use and Recovery of CO_2 in Greenhouses

	Use of CO2 in the Greenhouse		CO2 Recovery (if using boiler)	
	Yes	No	Yes	No
No. of responses	89	235	11	108
Percent of responses	27	73	9	91

Manufacturers of Greenhouses

Table 7.7 lists the manufacturers of the greenhouses. Paul Boers and West Brook are the major manufacturers. Twenty seven percent of the greenhouses were self-made while 26 percent, 16 percent, 15 percent, 11 percent and 7 percent were made by Paul Boers, West Brook, First Quality and Professional Gardener.

Table 7.7 Manufacture of Greenhouse

Manufacture Type		
Responses	**Manufacture**	**Percent of Responses**
89	Self-made	27
84	Paul Boers	26
53	West Brook	16
50	First Quality Greenhouse	15
35	Campbell Obrien	11
22	Professional Gardener	7
15	IBG	5
12	Declouet	4
9	Harnois	3
5	Canadian GH	2
4	B &W	1
47	Others*	15

* Greenhouse Growers Suppliers (GGS), Omni, Jacob, Lord and Burnham and Prins.

N=324

Use of Equipments in Greenhouses

Table 7.8 lists multiple environmental control system per grower. For an environmental control system 89 percent of growers used exhaust fans, 21 percent used Fan-Jet ventilation and 41 percent used manual systems.

Table 7.8 Environmental Control System of Greenhouses

	Environmental Control System		
	Exhaust Fans	**Manual**	**Fan-Jet Ventilation**
No. of responses	289	134	67
Percent of responses	89	41	21

Type of Natural Ventilation System in Greenhouses

Fifty two percent of the greenhouses were side vented followed by 17% Gutter Vented, 29% Ridge and 2% end vented in Alberta. Out of 324, three hundred and fourteen greenhouses possessed a natural ventilation system.

Table 7.9 Type of Natural Ventilation System in Greenhouses

	Natural Ventilation			
	Ridge	Gutter Vented	Side Vented	End Vented
No. of responses	92	55	162	5
Percent of responses	29	17	52	2

Horizontal Air Flow Fans and Cooling System

Table 7.10 lists the airflow fans and cooling systems. Seventy percent of the growers used Horizontal AirFlow Fans, but 17 percent, 11 percent and 2 percent used the Fogging System, Evaporative Coolers and Misting Systems.

Table 7.10 Horizontal Air Flow Fans and Cooling System

	Horizontal Air Flow Fans		Cooling System			
	Yes	No	None	Fogging System	Evaporative Coolers	Misting System
No. of responses	228	96	233	57	35	6
Percent of responses	70	30	70	17	11	2

Section VIII

Type of Computers

Table 8.1 indicates multiple types of computers used per grower. Thirty two percent did not report to use any kind of the listed computers. A PC is used for bookkeeping, internet, e-mail, bar codes, crop scheduling and diagnosing plant problem. All other types of computers are used for irrigation and environmental control.

Table 8.1 Use of Computers by Greenhouse Growers

	Computers					
	None	Priva	Argus	Wandsworth	Personal Computer (PC)	Others*
No. of responses	104	42	19	21	188	31
Percent of responses	32	13	6	6	58	10

*Delta, Sterling, Multinet, Grow Master, Rainberd, Irritol and Attenta.

Computers Use in Greenhouses

Fifty eight percent of the greenhouse growers used computers for bookkeeping and about 42 percent, 31 percent, 29 percent and 10 percent for Internet and e-mail, environmental control, irrigation and crop scheduling.

Table 8.2 Purpose of Use of Computers in Greenhouses

Computer Use For		
Responses	Computer Use	Percent of responses
188	Book-keeping	58
135	Internet	42
135	Email	42
101	Environmental control	31
95	Irrigation control	29
32	Crop scheduling	10
11	Diagnosing plant problem	3
7	Bar codes	2

Use of Lighting System

Table 8.3 lists the names and use of lighting systems by each region. Forty three percent of the growers reported high-pressure sodium followed by four percent of photo period light and five percent metal halide. Forty seven percent did not report to use lighting systems in greenhouses.

Table 8.3 Lighting System in Greenhouses by Region

Region	Lighting System					
	High Pressure Sodium	Photo period light	Metal Halide	Florescent	Mercury Vapor Light	None
1. Fort McMurray	0	0	0	0	0	2
2. Grande Prairie	8	0	0	1	1	17
3. Whitecourt	10	2	3	3	1	13
4. Edmonton	21	1	1	1	4	29
5. Bonnyville	8	3	0	1	0	5
6. Lloydminster	9	0	0	1	2	10
7. Red Deer	25	3	7	0	1	22
8. Calgary	17	3	6	1	0	21
9. Medicine Hat	36	1	0	0	0	16
10. Lethbridge	5	0	0	0	0	16
TOTAL	**139**	**13**	**17**	**8**	**9**	**151**
Percent of Total	**43**	**4**	**5**	**2**	**3**	**47**

Section IX

Water Usage in Greenhouses

Table 9.1 indicates multiple water sources per grower. Thirty six percent of the growers used city water, 35 percent used dug outs, 33 percent used wells, 5 percent used canals and 4 percent used rivers.

Table 9.1 Water Source Used by Growers in Greenhouses

	Water Source				
	Dug out	Well	Irrigation Canal	River	City Water
No. of responses	112	107	17	14	117
Percent of responses	35	33	5	4	36

Water Usage

As indicated in Table 9.2 only 35 percent of the growers kept record of water usage. Sixty five percent did not keep a record of water use.

Table 9.2 Water Usage by Greenhouse Growers

	Water Usage		
	Responses	Gallon/Year	No Response
No. of responses	113	113,310,000	211
Percent of responses	35	-	65

Irrigation System

Table 9.3 lists multiple irrigation system used per grower. Fifty percent of the growers used drip irrigation, 22 percent used overhead sprinklers and 72 percent used hand watering. Small growers used the hand-watering system.

Table 9.3 Irrigation Systems Used in Greenhouses

	Irrigation System		
	Drip Irrigation	Overhead Sprinklers	Hand Watering
No. of responses	161	70	233
Percent of responses	50	22	72

Quality of Water

Forty three percent of the growers reported the quality of water was hard water while 18 percent and 39 percent recorded soft and medium water.

Table 9.4 Quality of Water Used in Greenhouses

	Quality of Water		
	Hard Water	Soft Water	Medium
No. of responses	138	60	126
Percent of responses	43	18	39

Collection of Water from Greenhouse Roof

Table 9.5 indicated that 31 percent of the growers collected water from greenhouse roofs while 69 percent did not collect from greenhouse roofs.

Table 9.5 Collection of Water from Greenhouse Roof

	Collection of Water	
	Yes	No
No. of responses	101	223
Percent of responses	31	69

Water Tested for E.*coli* and Greenhouse Plants

Table 9.6 shows a water test for E.*coli* and greenhouse plants. Seventy nine percent did not test their water for E.*coli* because they live in the city or town limit. The city/town authority took care of testing water for E.*coli* for health purposes, but 21 percent of growers living out of city limit tested their water. Ninety percent of the greenhouse growers tested their water for plant growth but 10 percent did not.

Table 9.6 Water Tested for E.*coli* and Greenhouse Plants

	Water Tested for E.*coli*		Water Tested for Greenhouse Plants	
	Yes	No	Yes	No
No. of responses	67	257	290	34
Percent of responses	21	79	90	10

Water Treatment

Seventy nine percent of the growers did not use any water treatment. Ten percent used reverse osmosis, 3 percent used distillation and 2 percent used water conditioning. Few of them used more than one option.

Table 9.7 Water Treatment Used in Greenhouses

	Water Treatment				None
	Reverse Osmosis	Distillation	Water Conditioning	Other*	
No. of responses	32	10	7	25	255
Percent of responses	10	3	2	8	79

*Ozone, Filter system and Acid mixing.

Recycling and Disposal of Waste Water

Only 12 percent of growers recycled greenhouse water. Most of the small growers did not recycle their water. Forty three percent reported with no wastewater and 19% and 38% disposed of water through sewerage or depositing it in the ground.

Table 9.8 Recycling and Disposal of Waste Water

	Recycling of Water		Disposal of Waste Water		
	Yes	No	No Waste Water	Sewerage	Field/Ground
No. of responses	38	286	138	62	124
Percent of responses	12	88	43	19	38

Section X

Type of Fertilizers Used

Table 10.1 reports the use of major fertilizers. "Micronutrients" include iron, manganese, zinc, copper, magnesium, boron and molybdenum.

Table 10.1 Type of Fertilizer Used in Greenhouses

Use of Fertilizer			Use of Fertilizer		
Responses	**Fertilizer Type**	**Percent of responses**	**Responses**	**Fertilizer Type**	**Percent of responses**
153	Micronutrient	47	14	15-30-15	4
163	20-20-20	50	10	14-14-14	3
78	10-52-10	24	9	15-10-30	3
36	20-10-20	11	8	12-2-14	2
29	20-8-20	9	8	18-20-24	2
12	17-5-19	4	7	18-5-00	2
8	14-0-14	2	6	15-0-15	2
7	13-13-13	2	6	2-3-6	2
6	15-5-00	2	6	20-18-18	2
6	17-17-17	2	5	11-41-8	2
5	8-20-30	2	4	7-11-27	2
5	13-0-46	2	4	13-0-48	1
3	10-20-10	1	4	0-0-52	1
3	10-50-10	1	3	17-5-24	1
3	10-54-10	2	3	12-2-2	1
3	13-0-46	2	3	15-15-15	1
3	9-27-32	2	3	11-2-14	1
3	20-9-20	2	2	28-14-14	1
2	10-42-15	1	1	20-30-20	0
2	12-17-29	1	1	10-35-15	0
2	12-0-44	1	1	15-0-0	0
1	21-5-20	0	1	19-5-17	0
1	0-0-52	0	1	11-31-6	0
1	18-5-00	0	1	20-7-10	0

Fertilizers Used in Greenhouses

Most of the growers (33%) used Dosatron Injector System while 19 percent used Anderson and 10 percent used Smith.

Table 10.2 Use of Fertilizer Injector System in Greenhouses

	Injector Systems					None
	Anderson	Smith	Dosatron	Italian System from SDT	Other*	
No. of responses	60	31	107	3	65	63
Percent of responses	19	10	33	1	20	19

*Hanna (Portugal), Advantages, Dosamatic and Syphonex injector system.

Type and Amount of Fertilizer Used

Table 10.3 indicates multiple uses of commercial and own mixture fertilizer per growers. Only 86 percent of the growers disclosed the amount of fertilizer used per year while 14 percent did not disclose.

Table 10.3 Type and Amount of Fertilizer Used

	Amount of Fertilizer Used Per Year			Commercial Fertilizer or Make Your Own	
	Responses	Amount ($)	No Responses	Commercial	Own mixture
No. of responses	279	1,365,960	45	310	130
Percent of responses	86	-	14	96	40
Average/Grower	-	4,896	-	-	-

Section XI

Production of Marketing of Greenhouse Crops

Table 11.1 lists the varieties of cucumber, tomatoes, pepper, lettuce, eggplant and vegetables that were transplanted in greenhouses and the number of plants of each variety. "Others" in cucumber includes Subrina, Tessica, Odessa, Klunga, Dominica and Bodega. "Others" in tomatoes includes Dorasal, Red Chief, Vendor, Caruso, Heritage Varieties, Trust and Tumbler Varieties.

Table 11.1 Vegetable Production in Greenhouses

Cucumber		
Responses	**Cucumber (Varieties)**	**No. of plants**
44	Flamingo	332,577
10	Carmen (Long English)	4,170
10	Korinda	67,400
6	Ventura	12,002
6	Enigma	33,550
4	Corona	1,597
18	Others	29,700
Tomatoes		
Responses	**Tomatoes (Varieties)**	**No. of plants**
18	Beef Steak	28,800
17	Rapsodie	94,943
8	Tradiro	33,490
8	Cobra	5,197
6	Roma	840
4	Cherry Bell	2,590
3	Blitz	6,550
1	Upraiser	100
1	Dalton	1,200
29	Others	37,995
Pepper		
Responses	**Pepper (Varieties)**	**No. of plants**
22	Red, Yellow 444	54,512
5	Jalepeno	433
4	Kelvin	7,109
3	Edison	2,110
3	Bossanova	410
2	Eagle	650
Lettuce		
Responses	**Lettuce (Varieties)**	**No. of plants**
8	Butter Leaf	54,606
3	Elton	210,600
1	Hudson	420,000
1	Benganim	4,800

Egg Plant		
Responses	**Egg Plant (Variety)**	**No. of plants**
2	Dokrix	120
Vegetable Transplant Grown in the Greenhouse		
Responses	**Vegetable Transplant**	**No. of plants**
2	Cauliflower	1,500,600
1	Celery	500,000
6	Others	3,731,550

Top Selling Bedding Plants in Alberta

Table 11.2 lists the number of trays and bedding plants. Petunias, Marigolds, Geraniums and Pansies are the most popular plants in Alberta. " Other" bedding plants include Dahlia, Dracaena, Dianthus and Impatiens.

Table 11.2 Top Selling Bedding Plants in Alberta

Bedding Trays		
Responses	**No. of Trays**	
212	1,815,159	
Bedding Plants		
Responses	**Bedding Plant Type**	**No. of Plants**
207	Petunia	17,191,368
168	Marigold	7,020,954
136	Pansy	4,762,093
130	Geranium	1,142,937
95	Lobellia	4,137,859
49	Snapdragon	1,407,524
49	Tomatoes	383,069
44	Alyssum	2,556,079
46	Begonia	583,755
34	Impatiens	1,484,484
26	Bacopa	279,006
10	Dracena	102,004
11	Portulaca	89,648
8	Dusty Miller	62,320
7	Proven Winner	150,200
6	Fuchsia	87,250
4	Verbena	15,380
4	Million Bell	9,420
27	Others	214,548

Top Selling Hanging Baskets in Alberta

Table 11.3 lists the top selling hanging baskets. "Others" includes Butterfly Flower, Scaevola, Calendula and Vinca Vine.

Table 11.3 Top Selling Hanging Baskets in Alberta

Hanging Baskets		
Responses	**Hanging Baskets Type**	**Percent of responses**
132	Mixed	41
120	Supertunia	37
112	Ivy Geranium	35
97	Fuchsia	30
64	Begonia	20
39	Wave Petunia	12
32	Million Bell	10
11	Bacopa	3
9	Double Impatiens	3
6	Lobelia	2
4	Proven Winner	1
23	Others	7

Total Number of Hanging Baskets = 416,007

Top Selling Potted Flowers and Ornamentals

Fifty-seven, thirty and thirteen growers grew Poinsettias, Easter Lilly and Chrysanthemums. "Others" includes American Mountain, Russian Mountain, Ohio Buckeye, Big River, Cutleaf Weeping and Hydrangea.

Table 11.4 Top Selling Potted Flowers and Ornamentals

Potted Flowers and Ornamentals		
Responses	**Potted & Ornamental Type**	**No. of Plants**
57	Poinsettias	551,290
30	Easter Lilly	107,698
13	Chrysanthemums	450,336
5	Begonia	5,400
22	Others	120,134

Top Selling Cut Flowers

The following table shows popular cut flowers and the number of plants grown.

Table 11.5 Top Selling Cut Flowers

Cut Flowers		
Responses	**Cut Flowers by Type**	**No. of Stems**
19	Roses	104,684
18	Snapdragons	92,714
18	Asiatic Lilies	310,212
12	Oriental Lilies	48,993
12	Sunflowers	12,244
5	Lisianthus	12,340
5	Alstroemerias	6,972
1	Chrysanthemums	150,000

Top Selling Herbs

In Table 11.6 "Others" includes Angelica, Sage, Thyme, Savory and Oregano.

Table 11.6 Top Selling Herbs

Herbs		
Responses	**Herbs Type**	**No. of Plants**
66	Basil	59,938
43	Echinacea	359,285
36	Parsley	7,438
25	Calendula	25,821
17	St. John's Wort	13,080
12	Others	67,302

Top Selling Perennials

Hosta, Delphinium, Bleeding Heart and Peony are the most popular perennials in Alberta. "Others" include Mexican Mint, Forget-Me-Not, Hens and Chicks, Prairie Coneflower, Native Fern and Sage.

Table 11.7 Top Selling Perennials

Perennials		
Responses	**Perennial Type**	**No. of Plants**
110	Hosta	45,347
68	Delphinium	15,713
62	Bleeding Heart	14,922
53	Peony	17,706
47	Daylily	17,780
41	Sedum	17,701
38	Dianthus	28,974
34	Lupine	7,769
31	Silver Mound	14,390
30	Daisy	10,185
29	Bell Flower	18,474
27	False Spirea	6,599
20	Hollyhoch	7,522
20	Phlox	14,509
20	Iris	10,820
15	Columbine	4,411
15	Clematis	14,222
13	Foxglove	1,644
12	Poppy	6,368
10	Black-Eyed Sussan	1,965
10	Michaelmas	3,322
9	Primrose	11,462
8	Garden Mum	11,271
8	Snow-on-the-Mountain	1,837
7	Rock Cress	908
6	Monkshood	2,660
5	Violet	11,660
4	Ferns	865
3	Blanket Flower	1,980
3	Ground Covers	400
3	Beard-Tongue	114
3	Sage/Salvia	388
2	English Lavender	290
2	Cushion Spurge	300
2	Bugleweed	400
2	Lambs Ear	340
46	Others	22,566

Greenhouse Tree Seedlings Production

Out of 324 growers, 62 growers produce Spruce, Pine, Deciduous and other tree seedlings. Out of 22 spruce growers, 4 growers grow less than 500 plants, 3 grow 2000 plants, one grows 10,000 plants and 14 grow in millions. Out of 19 pine growers, 5 grow less than 500 plants and 3 grow less than 3,000. Out of 13 deciduous growers, 4 grow less than 500 plants and 2 growers grow less than 2000 plants. "Others" include Applecrab, Cherry and Mugho.

Table 11.8 Greenhouse Tree Seedlings Production

Tree Seedlings				
Responses	**Tree Seedlings Type**	**Seeding Time**	**Harvesting Time**	**No. of plants**
22	Spruce	Jan-March	Jun-Nov.	45,244,500
19	Pine	Jan-March	Jun-Nov.	22,348,500
13	Deciduous	Jan-March	Jun-Nov.	1,472,100
8	Others	Jan-March	Jun-Nov.	1,452,050

Cost of Production and Tissue Culture Material

Table 11.9 lists the number of growers who were interested in cost of production studies and the number of growers who grow tissue culture material.

Table 11.9 Cost of Production and Tissue Culture Material

	Interested in Cost of Production Studies		**Grow any Specialized Tissue Culture Material**	
	Yes	**No**	**Yes**	**No**
No. of responses	215	109	26	298
Percent of responses	67	33	8	92

Section XII

Insect Problems and Biological Control in Greenhouses

Aphids, Thrips, Whitefly and Fungus gnats were the major problems reported by growers. Three percent of the growers reported no insect problem.

Table 12.1 Major Insect Problems

Insect Problems			Insect Problems		
Responses	**Insect Type**	**Percent of responses**	**Responses**	**Insect Type**	**Percent of responses**
185	Aphids	57	25	Lygus bugs	8
133	Thrips	41	97	Spider mites	30
153	Whitefly	47	4	Leaf miners	1
129	Fungus gnats	40	3	Others	1
49	Shore flies	15	9	None	3

Responses for the Use of Biological Control Agents

This question was added later in the survey and was not asked of all growers. Thirty-seven percent of the growers used biological control agents while 55 percent did not use any for their crops.

Table 12.2 Responses for the Use of Biological Control Agents

	Use of Biological Control	
	No	**Yes**
No. of responses	178	119
Percent of responses	55	37

Purchasing of Biological Control

Thirty one percent of the growers purchased biological control agents from Westgro, 8 percent from Professional Gardener and 5 percent from Global and Natural Alternative. "Others" includes local stores.

Table 12.3 Purchasing of Biological Control

	Purchasing of Biological Control				
	Westgro	**Global**	**Natural Alternative**	**Professional Gardener**	**Others**
No. of responses	99	16	17	27	9
Percent of responses	31	5	5	8	3

Use of Biological Control Agents

Table 12.4 indicates the use of biological control agents. Growers mostly used Encarsia Formosa (19%) and Hypoaspis mile (12%). "Others" includes Safer Soap, Dematoil and Thiodan.

Table 12.4 Use of Biological Control Agents

Use of Biological Control			Use of Biological Control		
Responses	**Biological Control Type**	**Percent of responses**	**Responses**	**Biological Control Type**	**Percent of responses**
17	*Aphidius colemani*	5	40	*Hypoaspis miles*	12
61	*Encarsia formosa*	19	30	Ladybugs	9
13	*Aphidoletes aphidimyza*	4	7	Lacewings	2
29	*Phytoseiulus persimilis*	9	16	*Bacillus thuringiensis (B.t)*	5
36	*Amblyseiulus cucumeris*	11	21	Others	6
27	*Orius spp*	8			

Success of Biological Control and Effectiveness of Insecticides

Eighty-seven of the growers were successful with the use of biological control. Fifty-four of the growers reported that he use of insecticides was less effective.

Table 12.5 Success of Biological Control and Effectiveness of Insecticides

	Success with Biological Control		Effectiveness of Insecticides		
	Yes	**No**	**No**	**Yes**	**Less effective**
No. of responses	104	15	101	49	174
Percent of responses	87	13	31	15	54

Use of Bumble Bees and Pesticide Recommendation

Thirty four percent of the tomato growers reported the use of bumblebees for pollination. Growers used multiple pesticide recommendations. Seventy nine percent of the growers got pesticide recommendations from private sources and 46 percent received recommendations from government. Eight percent never used pesticides.

Table 12.6 Use of Bumble Bee and Pesticide Recommendation

	Use of Bumble Bees for Pollination		Pesticide Recommendation		
	Yes	**No**	**Government**	**Private**	**None**
No. of responses	23	45	150	256	25
Percent of responses	34	66	46	79	8

Chemicals Need To Get Registered

Most of the growers did not use chemicals. Three percent and two percent of growers needed to get registered for Admire and Ethel, while one percent for Thiodan, Pirimor and Temik. "Others" include Temic, Benlate, Tolstar, Diazinon, Botani Gard and Oxyfloren.

Table 12.7 Chemicals Need To Get Registered

Registration of Chemicals			Registration of Chemicals		
Responses	**Chemicals Type**	**Percent of responses**	**Responses**	**Chemicals Type**	**Percent of responses**
11	Admire	3	5	Thiodan	1
2	Pirimor	1	8	Others	2
6	Ethrel	2			
4	Temik	1			

Disease Problems

Table 12.8, 12.9 and 12.10 list responses of survey participants regarding the question on diseases and virus problems. Sixty one percent, 9 percent, 47 percent, 3 percent and 6 percent of the growers reported Pythiuml, Wilting, Botrytis, Powdery Mildew, Tomato Virus and Tobacco Virus. There are multiple root diseases per grower.

Table 12.8 Root Diseases

	Root Diseases			
	Pythium/ Damping off	**Wilting**	**Other**	**None**
No. of responses	198	28	7	109
Percent of responses	61	9	2	34

Table 12.9 Leaf and Stem Diseases

	Leaf and Stem Diseases			
	Botrytis	**Powdery Mildew**	**Other**	**None**
No. of responses	151	148	6	102
Percent of responses	47	46	2	31

Table 12.10 Leaf Viruses

	Leaf Viruses		
	Tomato Spotted Wilt Virus	**Tobacco Mosaic Virus**	**None**
No. of responses	10	18	299
Percent of responses	3	6	92

Section XIII

Manpower Use in Greenhouses

Three hundred and twenty four growers employed 1,360 full time and 2,841 part time. Only sixty nine percent of the growers disclosed manpower expenditures.

Table 13.1 Manpower Usage

	Number of People Employed		Total Manpower Expenses	
	Full time	Part time	Responses	Expense ($)
No. of responses	1,360	2,841	225	17,248,855
Percent of responses	-	-	69	-

Food Safety, Employment for Olds College and Trained Labour

Table 13.2 shows that only eight percent of the vegetable growers had food safety training program for their staff. Seventy five percent of the growers did not employ Olds College graduates. Sixty nine percent reported the non-availability of trained labour.

Table 13.2 Food Safety, Employment for Olds College and Trained Labour

	Do You Have Food Safety Training Program for Staff?		Have You Ever Employed Students From Olds College?		Is Trained Labour Available?	
	Yes	No	No	Yes	Yes	No
No. of responses	16	173	243	81	102	222
Percent of responses	8	92	75	25	31	69

Section XIV

Greenhouse Taxation and Insurance Issues

Table 14.1 shows only 13 percent of the growers expressed concern regarding for higher tax. Seventy three percent of the growers paid for farming and 27 percent paid for business taxes.

Table 14.1 Greenhouse Taxation Issues in Alberta

	Tax Form		Taxation Issue	
	Farming	Business	None	High Taxes
No. of responses	233	88	264	41
Percent of responses	73	27	87	13

Availability of Insurance and Help From GH Specialists

Thirty percent of the growers indicated the non-availability of insurance. Eighty nine percent of ther growers were aware of GH Specialist's help in crop management.

Table 14.2 Availability of Insurance and Help From GH Specialists

	Is GH Insurance Readily Availabe?		Awareness of GH Specialist's Help in Crop Management	
	Yes	No	Yes	No
No. of responses	224	95	288	36
Percent of responses	70	30	89	11

Membership of Alberta Greenhouse Growers Association (AGGA)

Sixty four percent of the growers were not members of the Alberta Greenhouse Growers Association (AGGA). However, 47 percent would like to become members of AGGA.

Table 14.3 Membership of Alberta Greenhouse Growers Association (AGGA)

	AGGA Membership		
	Yes	No	Would like to Be a Member
No. of responses	116	208	98
Percent of responses	36	64	47

Greenhouse Insurance Companies

Thirty eight percent of the growers did not have insurance. Most of the growers had insurance with Cedar Square, Thompson Fisher, Co-operators and Wawanesa. "Others" include local insurance companies.

Table 14.4 Greenhouse Insurance Companies

Insurance			Insurance		
Responses	**Company Name**	**Percent of responses**	**Responses**	**Company Name**	**Percent of responses**
37	Cedar Square	11	1	White Court Ins.	-
36	Thompson Fisher	11	1	Eccliastic (Vegreville)	-
31	Co-operators	10	1	Eldon Ray Ins. (Beaverlodge)	-
23	Wawanesa	7	1	Peace Sells	-
11	Marsh Canada	3	1	Mckillop	-
5	Westren Union	2	1	Pencord	-
2	Kemper	1	1	Clay Robertson	-
2	General Ins.	1	1	Lewis Wright	-
2	Gauliver	1	35	Others	11
1	Eckrim (Eckville)	-	123	None	38
1	Hellen Henley (Rocky Mtn. Hse)	-			

Section XV

Purchase of Greenhouse Materials, Imports and Export of Produce

Table 15.1 lists the purchasing of plants or plant-seed materials from different companies. Forty percent of the growers bought from JVK, 30 percent bought Dentoom and 26 percent bought Stokes. "Others" include local stores.

Table 15.1 Purchasing of Plant or Plant-Seed Material

Purchasing of Plant Material			Purchasing of Plant Material		
Responses	Company Name	Percent of responses	Responses	Company Name	Percent of responses
130	JVK	40	2	De Rouiter Seed (USA)	1
96	Dentooms	30	2	Seed Centre	1
85	Stokes	26	2	Park Seed	1
70	Ball	22	2	Canadian Gardener	1
40	H. Q	12	2	Westgro	1
35	Yoder	11	2	Tree Nursery(BC)	1
34	Through Red-Hat Coop.	10	1	Permere (MB)	-
24	Bevo	7	1	Innova Plants (Germany)	-
14	Paridan	4	1	Morris (USA)	-
13	Houweling	4	1	Suntech	-
13	Express Seed (USA)	4	1	Genesis (BC)	-
12	Qualtec GH	4	1	Jackson & Perkins	-
10	Consultant	3	1	Terra Nigra	-
9	Professional Garden	3	1	Brons & Sons (BC)	-
8	T&T	2	1	Van-Volten (BC)	-
8	Panam America	2	1	Nordec	-
6	Northern Innovator	2	1	Eagle Lake	-
6	Burnaby Lake (BC)	2	1	Thompson & Margon	-
5	Winard	2	1	Byland (BC)	-
5	Thiel's GH	2	1	Hydro Garden (Ont.)	-
5	Progro	2	1	Coast Agriculture (BC)	-
4	Oyen GH	1	1	Westwinder Nurseries(Ont.)	-
4	USA	1	65	Others	20
2	Schumlling (Germany)	1			

Use of Promotional Methods

Table 15.2 shows the use of multiple methods to promote the marketing their production. Seventy six percent of the growers used roadside signs, 52 percent used the local paper, 67 percent used flyers or personal contacts and 14 percent used the Red-Hat Coop.

Table 15.2 Use of Promotional Methods

	Promotional Methods					
	Local paper	Radio	TV	Red-Hat Coop	Road side sign	Others/ Flyers
No. of responses	168	49	16	45	246	218
Percent of responses	52	15	5	14	76	67

Marketing Methods

Table 15.3 presents multiple use of marketing methods per growers. Seventy percent of the growers sold their produce through retail, 40 percent sold through wholesale, 14 percent sold through Red-Hat Coop, 19 percent farmers market and four percent sold through consulting firms. Tree seedling growers used consulting firms for marketing their produce.

Table 15.3 Marketing Methods

	Through Red-Hat Coop	Retail	Wholesale	Consulting Firm	Farmers Market
No. of responses	45	227	129	12	60
Percent of responses	14	70	40	4	19

Import of Produce/Plant Material

Table 15.4 shows 61 percent of the growers do not import produce or plant material but 39 percent do. Out of 39 percent, twenty nine percent disclosed the expenditure ($2,892,123) on import but 10 percent did not share this information. The Medicine Hat vegetable growers imported through Red-Hat Coop; that import figure is not available.

Table 15.4 Import of Produce/Plant Material

	Growers Response for Import		Value of Import		
	No	Yes	Responses	Amount ($)	No Response
No. of responses	198	126	94	2,892,123	32
Percent of responses	61	39	29	-	10

Importation by Companies

Data in Table 15.5 shows that eight percent of growers imported through JVK, seven percent through Balls, five percent through Bevo, four percent through Yoder, two percent through Express Seed, Panam America and Burnsbilake.

Table 15.5 Importation by Companies

Importation			Importation		
Responses	**Company Name**	**Percent of responses**	**Responses**	**Company Name**	**Percent of responses**
26	JVK	8	2	Winnart	1
23	Ball	7	2	Tree Nursery (BC)	1
17	Bevo	5	1	Morris (USA)	-
12	Yoder	4	1	De Rouiter Seed (USA)	-
8	Express Seed (USA)	2	1	Bron & Sons (BC)	-
7	Panam America	2	1	Coast Agri. (BC)	-
6	Burnaby Lake (BC)	2	1	Byland (BC)	-
5	Hauweling	2	1	Westwinder/ Wing Nurseries	-
4	Germany	1	1	Hydro Garden (Ont.)	-
4	Northern Innovator	1	24	Others	7

Methods of Product Pricing

Seventy five percent of the growers price their products themselves. Tree seedling growers (2%) accept buyer's price while six percent that were wholesalers as well as retailers negotiate their product price. Red-Hat Coop determined the prices for their members. Nine percent of growers that belong to institutions do not sell their produce.

Table 15.6 Methods of Product Pricing

	Product Price				
	Grower	**Buyer**	**Both**	**Red-Hat Coop**	**None**
No. of responses	243	8	19	45	9
Percent of responses	75	2	6	14	3

Export of Produce or Plant Material

Tables 15.7 & 15.8 list the exportation of produce or plant material. Ten percent of the growers exported their produce outside of Alberta. Medicine Hat area growers sell through Red-Hat Coop. Red-Hat Coop exported 0.45 percent of the total sales of $20.5 million for 2000. Seventeen growers exported outside Canada. Out of 17, thirteen growers did not wish to disclose the value of exports. Thirty-two growers exported inside Canada but only 19 growers shared the information.

Table 15.7 Export of Produce or Plant Material

	Exportation of Produce	
	No	Yes
No. of responses	292	32
Percent of responses	90	10

Table 15.8 Export Inside and Outside Canada

	Export Inside Canada			Export Outside Canada		
	Responses	Amount ($)	No Response	Responses	Amount ($)	No Response
No. of responses	19	3,345,500	13	4	1,692,500	13
Percent of responses	59	-	41	23	-	76

Section XVI

Value of Greenhouse Assets and Gross Sales

Out of 324 growers, 81 percent disclosed the information about their value of total assets and annual gross sales while 19 percent did not share this information. The value of total assets includes the value of land associated and residence with the greenhouse. An annual gross sale includes the sales of the greenhouse products.

Table 16.1 Value of Assets and Gross Sales

	Value of Total Assets			Annual Gross Sales		
	Responses	Amount ($)	No Response	Responses	Amount ($)	No Response
No. of responses	263	192,621,677	61	262	84,803,859	62
Percent of responses	81%	-	19%	81%	-	19%

Section XVII

Issues Facing the Greenhouse Industry

Tables 17.1 & 17.2 indicate problems faced by growers. Out of 324 growers six percent, nine percent, five percent and four percent reported problems in marketing, financing, information and plant management. For further details on the problems faced by growers, please see Appendix 1.

Table 17.1 Marketing and Financing Problems

	Marketing Problems		Financing Problems	
	Yes	No	Yes	No
No. of responses	20	304	30	294
Percent of responses	6	94	9	91

Table 17.2 Information and Plant Management Problems

	Information Problems		Plant Management Problems	
	Yes	No	Yes	No
No. of responses	17	307	14	310
Percent of responses	5	95	4	96

Appendix 1. Marketing, Financing, Information and Plant Management

Marketing Problems

- Red-Hat Coop prices can not be matched by small vegetable growers
- Lack of marketing choices in small towns
- Counties do not allow signs to be put up on the highways.
- Transportation is expensive
- Finding contacts with wholesale is difficult
- If the governement allows growers to grow tree seedlings in open areas and does not maintain tree seedlings, standard greenhouses will lose their business.
- Hard to find market for produce
- Marketing costs are high
- Hard to compete with BC prices
- Advertizing is expensive
- Hard to compete with big growers
- No regular market in Grande Prairie. The market is often closed
- Big growers sell less than cost

Information Problems

- To realize the time-sensitive nature of this business, the government should hire more extension workers to help on the time frame
- Need a lab in Red-Hat Coop
- Need more information about year round crops
- Need more information about growing herbs
- Labs are not efficient to provide results on time. We sent insects to Ottawa's lab and the results came back after 18 months
- No registered pesticides for herbs
- Need more research on indoor plants and bedding plants

Financing Problems

- Very hard for small growers to get financing
- Interest on loans is high
- Hard to pay back loans as the product price is very low
- Hard to get money for a new business
- Banks do not have a knowledge about the greenhouse industry
- Government financing is only available if greenhouses are built on farms and not in town
- Financial Institutions are not comfortable with this business

Plant Management Problems

- Clematis is a new crop and there is very little information available
- Trained labour is not available
- Information is not available on how to grow on soil
- Hard to find skilled/unskilled labour
- Need more information on biological control agents

Appendix 2. Remarks/Comments

1. General

- Need more informatin/help on lettuce crop
- Non-availability of trained labour
- No rebate on gas after 1991
- Need more help from extension workers to control whitefly problem
- Registration of chemicals should be made easier and faster
- Need grants not loans. The Government's programs do not work for small growers
- Revenue is not as high as a few years ago
- There should be a uniformity in chemical registration in all provinces
- Many chemicals are registered in Holland but not in Canada. Holland's products compete with Canada
- More chemicals should be registered
- There should be a lower interest rate and down payment for loans
- Need Alberta Advantage/Gas rebate
- Need seminars/short courses for one day
- Need grants for improving greenhouses
- Need protection for local growers
- Greenhouse industry should be treated as farming rather than commercial
- Need more work shops in Lethbridge
- The Government should control the cost of production
- There should be communication between local growers
- Need grants for alternate of gas
- Plant seeds should be sold by weight not count
- Need concession on gas
- Greenhouse industry should be recognized as farming at all levels
- In competition with BC, but Alberta's products are fresh
- Need subsidy on input costs
- Greenhouse expansion is out of control. Need controlled and steady growth in this industry
- Need grants for alternative energy systems
- Labour should be recognized as farming
- Need grants to convert to solar power
- Need industry input for educational requirements
- Business and personel taxes are high
- Can not get provincial loans. Federal loans are smaller
- Chemicals should be registered at the North American level

- There should be an apprenticeship program for the greenhouse industry along with a wage subsidy program for this industry
- The Government has to have research done before promoting GH industry
- Many hurdles from the city for upgrading greenhouses
- Need more lab facilities. More exibition and demonstrations for equipment & material for this industry
- Stability in gas prices needed for future plan
- Wholesale stay in wholesale and retail in retail
- There should be research on marketing aspect. We do not know what to produce
- Farm water is free, but town water is billed
- The Government does not allow to put signs on major highways
- Need fair tax inside city and the country side
- Alberta retail area requires glass to serve public, but Ontario allows poly. Glass is more expensive than poly
- Need more extension resources
- Government should educate people properly to start businesses
- Government should provide greenhouse crop insurance
- Include color pictures of plant diseases in GH coverings
- Red Hat Coop & Pick-n-Pack hurt non-member prices
- Government should provide grants to develop a wind-powered generator for saving energy
- Labour laws for the greenhouse industry should work like farming industry (No over time)
- Beef industry gets concession in gas, why not the GH industry
- We produce gas. We have to get benefits out of it
- Need a greenhouse production guide. British Columbia has, but Alberta does not
- Need varietal trial in gerenium, poinsettia, basket and planter stuffers
- Government should stop exporting gas and bring its price down
- Clean water is a major issue in the countryside
- There should be two prices for gas, one for AB and a different price for others
- The US buys cheaper gas and they export products to our market
- Government has to recognize seasonal jobs in the greenhouse industry
- Need a clearcut definition of the GH industry for insurance
- In seminars, address small grower's problems not just big grower's problems
- Communities in bloom is a good idea to encourage the business
- Parkinglot greenhouses should be stopped. People come from BC, make some money and go back
- Small growers do not pay GST (>30,000) but big growers do. There should be a GST waiver on the first $30,000.

- Whatever chemicals are used in the USA should be allowed here because of their products are in competition with Canada.
- *Keep Alberta trees in Alberta.*
- Need clear definition of this industry for insurance workers compensation, labour standard and taxation

2. Specific Comments/Suggestions for Alberta Greenhouse Growers Association (AGGA)

- Alberta tomatoes are better in taste than California tomatoes. AGGA should create this awareness
- Need to buy directly from companies and not through middlemen. AGGA must consider these things
- AGGA must suggest the base price in each area for plants
- AGGA should set up as coop to buy gas and insurance and sell it to growers
- AGGA works for big growers
- AGGA should work with Flower Canada for chemical registration
- Calgary should be considered for trade shows every 2nd year
- AGGA must have regular communication with members
- AGGA must improve their services
- Greenhouse growers should support each other. AGGA must work on it

Appendix 3. Region, City and Related Greenhouse Area

Region	City	Size of GH (Sq. ft)
Bonnyville		**953058**
	Ardmore	1350
	Bellis	3000
	Bonnyville	469744
	Breynat	20000
	Cold Lake	10000
	Elk Point	6664
	Lac La Biche	3060
	Smoky Lake	380040
	St. Paul	59200
Calgary		**1556816**
	Airdrie	27800
	Balzac	100000
	Black Diamond	40000
	Bragg Creek	21000
	Calgary	484190
	Carseland	30000
	Cluny	18000
	Dalemead	1500
	Dewinton	44000
	Drumheller	41606
	High River	457000
	Lyalta	20000
	Millarville	25000
	Nanton	12000
	Rockyford	14000
	Standard	54000
	Strathmore	144940
	Swalwell	18580
	Turner Valley	3200
Edmonton		**1722512**
	Ardrossan	32300
	Bon Accord	25000
	Bruderheim	45000
	Edmonton	564800
	Gibbons	25000
	Lamont	5300
	Leduc	20000

	Legal	167500
	Morinville	86000
	Onaway	7200
	Redwater	4192
	Sherwood Park	439220
	Spruce Grove	129000
	St. Albert	149500
	Stoney Plain	2500
	Stony Plain	20000
Fort McMurray		**30900**
	Anzac	10000
	Fort Mcmurray	10900
	Fort Vermillion	10000
Grande Prairie		**940334**
	Beaverlodge	434220
	Bezanson	7680
	Debolt	800
	Fairview	268400
	Grande Prairie	95580
	High Level	6600
	Jean Cote	60000
	Manning	2880
	Peace River	7122
	Sexsmith	10000
	Slave Lake	10000
	Smith	15200
	Valley View	9400
	Wanham	4252
	Wembley	8200
Lethbridge		**350709**
	Barons	15000
	Brooks	2400
	Claresholm	13981
	Coaldale	73300
	Coutts	600
	Fort Macleod	18000
	Hillcrest	20000
	Lethbridge	152728
	Monarch	2700
	Pincher Creek	33000
	Shaughnessy	13000

	Taber	6000
Lloydminster		**279530**
	Castor	46000
	Coronation	8000
	Daysland	7800
	Edgerton	2640
	Forestburg	102000
	Heisler	1800
	Hughenden	5000
	Irma	12720
	Killam	1800
	Kitscoty	4320
	Lavoy	7500
	Lloydminister	20000
	Lougheed	2000
	Marwayne	10500
	Vegreville	21000
	Viking	2000
	Wainwright	24450
Medicine Hat		**3778252**
	BI	25000
	Brooks	16000
	Duchess	15000
	Dunmore	50000
	Enchant	1024
	MH	872798
	Oyen	60000
	Redcliff	2738030
	Vauxhall	400
Red Deer		**1910868**
	Alix	1500
	Armena	5000
	Blackfalds	443000
	Bluffton	5000
	Camrose	12000
	Cremona	40000
	Delburne	3800
	Didsbury	12000
	Eckville	17460
	Edberg	4000
	Elnora	13700

	Innisfail	16000
	Lacombe	501000
	Leslieville	6000
	Millet	32260
	New Norway	22000
	Olds	26100
	Penhold	100000
	Ponoka	15838
	Red Deer	438318
	Rocky Mtn. House	39000
	Stettler	59392
	Sundre	21000
	Sylvan Lake	12000
	Three Hills	5000
	Trochu	26000
	Wetaskiwin	33500
Whitecourt		**274972**
	Athabasca	3000
	Barrhead	27060
	Boyle	3640
	Cherhill	2800
	Clyde	14000
	Dapp	300
	Drayton Valley	14400
	Edson	32000
	Entwistle	10000
	Gunn	4032
	Hinton	17840
	Mayerthorpe	18700
	Neerlandia	24000
	Niton Juction	22000
	Peers	2800
	Pickardville	2400
	Rochester	12000
	Sangudo	15000
	Thorhill	3500
	Tomahawk	2000
	Vimy	9000
	Westlock	2700
	Whitecourt	31800
Grand Total		**11,797,951**

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